Plate 2.

Fig. 12.

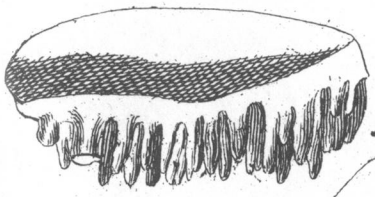

Fig. 9.

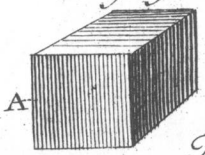

Fig. 10.

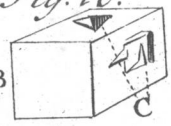

Fig. 7.

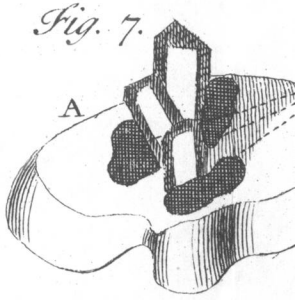

Fig. 11.

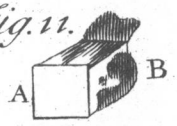

Fig. 13.

Fig. 1.

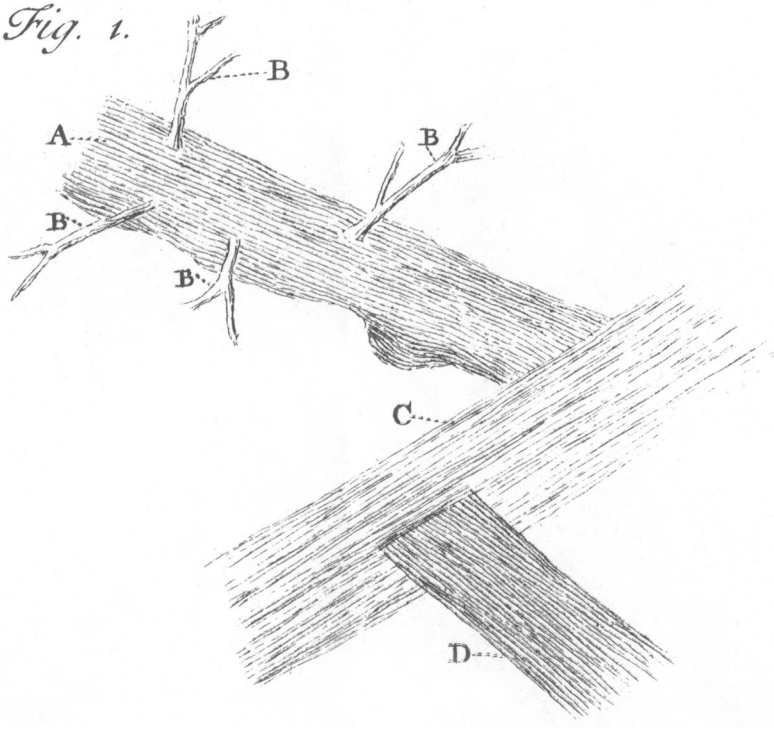

Fig. 2.

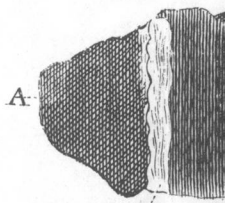

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Fig. 7.

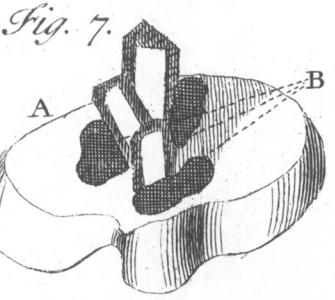


Fig. 8.

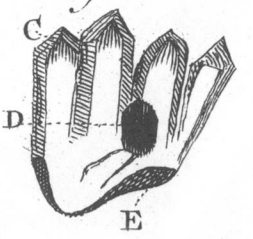


Fig. 5.

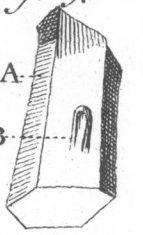


Fig. 6.

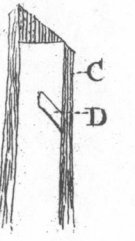


Fig. 4.

Fig. 3.

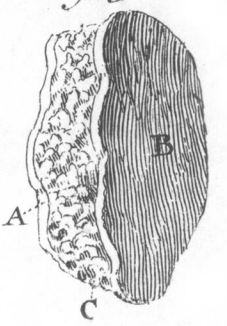
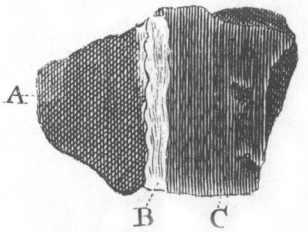


Fig. 2.



New-York and *Britain*, which on the Northern Part may be made ſo wide as to take in the *Newfoundland* Trade, *&c.* But I ſhall mention no more Particulars; for in the ſame Manner it will be eaſy to conſtruct *Tables* to all thoſe conſiderable Parts of the World, to which Voyages are perform'd.

V. *Some Obſervations towards compoſing a Natural Hiſtory of* Mines *and* Metals, *communicated in a Letter to Dr.* Rutty, S. R. Secr. *&* Coll. Med. Lond. Soc. *By Dr.* Frank Nicholls, Profeſſor *of* Anatomy *at* Oxford.

Dear Sir,

IN Obedience to your Commands, I here ſend you the Particulars of what I obſerv'd during a Year's Stay in the Weſtern Part of *Cornwall*, concerning *Mines*, &c.

Mines in general are Veins or Cavities within the Earth, whoſe Sides receding from, or approaching nearer to each other, make them of unequal Breadths in different Places; ſometimes forming large Spaces, which are call'd Holes. They are fill'd with Subſtances, which, whether metallick, or of any other Nature, are term'd the *Loads*. When the Subſtances forming theſe Loads are reducible to Metal, the Loads are by the Miners ſaid to be *alive*; otherwiſe they are term'd *dead Loads*.

In

In *Cornwall* and *Devon* the Loads always hold their Courſe from Eaſtward to Weſtward; tho' in other Parts of *England* they frequently run from North to South. The Miners report, that the Sides of the Load never bear in a Perpendicular, but conſtantly underlay either to the North or South.

The Mines ſeem to be, or to have been, the Channels thro' which the Waters paſs within the Earth; and, like Rivers, have their ſmall Branches opening into them in all Directions; which are by the Miners term'd, the *Feeders* of the Load.

Moſt Mines have Streams of Water running thro' them, and when they are found dry, it ſeems to be owing to the Waters having changed their Courſe, as compell'd to it, either becauſe the Load had ſtopp'd up the antient Paſſages, or that ſome new and more eaſy ones are made.

The Load is frequently intercepted by the croſſing of a Vein of Earth, or Stone, or ſome different metallick Subſtance. In which Caſe it generally happens, that one Part of the Load is moved a conſiderable Diſtance to one Side. This tranſient Load is by the Miners term'd a *Flooking*; and the Part of the Load which is moved, is, in their Terms, ſaid to be *heaved*. This heaving the Load would be an inexpreſſible Loſs to the Miner, did not Experience teach him, that, as the Loads always run on the Sides of the Hills, ſo the Part heaved is always moved towards the Deſcent of the Hill. So that the Miner working towards the Aſcent of the Hill, and meeting a *Flooking*, conſiders himſelf as working in the Part heaved; wherefore cutting thro' the *Flooking*, he works upon its Back towards the Aſcent of the Hill, till he recovers the Load, and *vice verſâ*.

Thus in *Figure* the *firſt*, A D ſhews a Load running in the Side of a Hill, B the *Feeders*, C the *Flooking*, D is the Part *heaved*.

Sometimes, tho' not conſtantly, the Mine is lined with an intermediate Subſtance between the Load and it ſelf. This is (properly ſpeaking) the Wall of the Load: Though, in the common Acceptation of that Term, it ſignifies either ſuch intermediate Subſtance, or the Side of the Mine, where the Load immediately unites it ſelf to it. Thus in *Figure* the *ſecond*, A is the Side of the Mine, B the intermediate Wall of white Mundick, C the Load of Copper. And in *Figure* the *third* A B the two Walls of *Spar-Stone*, C a ſmall Vein of *Tin Oar*.

The Springs in theſe Parts are always hard, as abounding very much, either in ſtony, or *ſulphureo-ſaline* Particles.

From this Water thus ſaturated with ſtony Particles, we frequently find the Paſſages of the Water under Ground, either partly, or totally ſtopp'd up; the ſtony Matter gradually concreting round the Sides of the Mine, and forming thereby a confuſed Load of Spar-Stone.

At other Times this ſtony Matter concretes more diſtinctly: In which Caſe the ſtony Matter ſeems to be govern'd in its Concretion by a *Plaſtick* Power.

N. B. When I ſpeak of a *Plaſtick* Power, I would be underſtood as meaning only a *Modus* of *Attraction*, by which the attracted Particles are rang'd in this or that determin'd Form. This Power then ſo exerts its Action, as to range the concreting Matter into the Form of an *hexagonal Priſm*, whoſe Head goes off in an

hexagonal Pyramid. Where this plaſtick Power happens to be ſingle and uncontroul'd, it preſerves the Form of the Criſtal to very conſiderable Magnitudes.

In theſe ſingle Criſtals we may obſerve, that they are of different Tranſparencies and Colours, as the ſtony Matter is more or leſs diſengaged from other Subſtances, or as thoſe other Subſtances are capable of imparting different Tinctures to them. And that they ſeem form'd *laminatim*; tho' the *Laminæ* are only diſtinguiſhable, when the Matters from whence the Criſtal is ſucceſſively form'd, happens to differ in Purity. Thus in *Figure* the *fourth*, the Criſtal was at firſt form'd from Matter intangled with a foul yellow Subſtance; after which, a pure Matter advening, the Criſtal was in its future Lamination form'd more pure and tranſparent.

But where the plaſtick Particles are more numerous, there ſeems Reaſon to believe, that theſe very *Plaſtick Particles*, before they are fix'd, are ſubject to the Controul and Direction of any fix'd *plaſtick Particle*, within the Verge of whoſe Activity they happen to move: notwithſtanding which, after they are once fix'd, they exert their own *plaſtick Powers*, and, in Conjunction with the firſt *plaſtick Particle*, govern the future Concretion, in ſuch Manner as to form a ſeemingly irregular Criſtal, tho' compoſed of two or more regular Criſtals. Thus in *Figure* the *fifth* and *ſixth* A and C ſeem to have attracted amongſt the ſtony Particles, two plaſtick Particles, which afterwards exerting their own Powers, form the additional Criſtals B and D.

There are many Phænomena obſervable in theſe Criſtals, which, at preſent, I may paſs over, as leſs relating

lating to the Affair of *Metals*; wherefore I ſhall only add, that theſe criſtalline Concretions exert a ſtrong Attraction on many metallick Subſtances. As in *Fig.* 7. A the Spar has attracted the three Portions of Lead B. and in *Fig.* 8. the Criſtals C have attracted the Copper D, and are attracted by the Lead E.

The *ſulphureo-ſaline* Particles, with which, as I obſerved, the Waters are frequently ſaturated, are found to be either of a vitriolick or an arſenical Nature: The firſt conſtantly, if pure, concreting into white *Cubes* reſembling Grains of Silver, while the arſenical Sulphur concretes into yellow Cubes like Grains of pure Gold. Both theſe are by the Miners term'd *Mundick.*

Theſe *ſulphureo-ſaline* Subſtances ſeem directed in their Concretions by a plaſtick Particle, in the ſame Manner as the Criſtals above-mention'd; and, like them, upon the ſame Principles, are found ſimple or compound. In their Sides you may obſerve the Concretion forms it ſelf like Threads, which in three Sides run in different Directions, but are always ſimilar in the oppoſite Sides.

Fig. 9. ſhews one of theſe Cubes, A the parallel Threads.

Fig. 10. ſhews another of theſe Cubes, from whoſe Sides ariſe ſmall Segments of Cubes C.

But this *plaſtick Power* ſeems to be weaken'd or deſtroy'd, in Proportion, as this ſulphureous Matter is more or leſs intangled with metallick Subſtances.

Thus in *Fig.* 11. the plaſtick Particle ſeems for a while to have exerted its Power in the uſual Manner, till the advening Matter grew intangled with a ſmall Quantity of Copper, after which it ſeems only to have exerted its *attractive* but not its *plaſtick Power.*

And

And in *Fig.* 12. the white *Mundick* being infected with Iron, ſeems ſo far from being affected by a *plaſtick Power*, that it concreted in the Form of Icicles from the Fluid which tranſuded thro' the Top of the Mine.

Fig. 13. repreſents ſome ſmall Cubes of white or vitriolick *Mundick.*

But to return to the Mines: They are found to contain Tin, Lead, Copper, Iron, and a pſeudometallick Subſtance, by the Miners term'd *Gliſt:* For the Particulars of all which, as they would vaſtly ſwell the Bulk of one Letter, I muſt refer you to my next.

I am,

With the utmoſt Reſpect,

Your obliged Friend,

Fran. Nicholls.